

Eucoilid Parasites of Agromyzid Leafminers in Hawaii (Hymenoptera: Cynipoidea)

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ABSTRACT

Keys and taxonomic descriptions are provided for Eucoilidae associated with agromyzid leafminers in Hawaii. Four genera of such eucoilids are represented in Hawaii: *Gronotoma* Förster with three species, two of which are described as new; *Disorygma* Förster and *Ganaspidium* Weld with one species each, and *Weldia* Yoshimoto, an endemic complex, the species of which are not treated in this paper. The *Ganaspidium* species previously determined as *G. hunteri* (Crawford) was found to be an undescribed species, and the name *Ganaspidium utilis* is here proposed for it. Two new combinations are proposed: *Disorygma pacifica*, for *Cothonaspis pacifica* Yoshimoto and *Gronotoma micromorpha* for *Eucoilidea micromorpha* Perkins. *Eucoilidea rufula* Yoshimoto is placed as a junior synonym of *Gronotoma micromorpha* (Perkins).

The family Eucoilidae is a large but poorly known group of Cynipoidea, all of which develop as larval-pupal parasitoids in hosts belonging to the dipterous suborder Cyclorrhapha. The Hawaiian eucoilid fauna contains several poorly understood endemic species complexes, plus about two dozen apparently non-endemic species, most of which are probably accidental introductions of relatively recent origin. Several of the latter have not been reported in the published literature.

The Hawaiian Eucoilidae were reviewed by Yoshimoto (1962a), but additional revisionary work is needed for the proper understanding of the group. Because of the economic importance of agromyzid leafminers and interest in parasitoids which attack these pests, the present paper was prepared to cover the introduced eucoilid species that are known to attack agromyzid larvae in Hawaii.

Reference is made in the key below to the *Weldia* group, an apparently endemic species complex associated with the endemic Hawaiian leaf-miner species (possibly a species complex), *Liriomyza cocculi* Frick. The *Weldia* group will be treated in detail in a later paper.

I am very much indebted to Dr. Göran Nordlander of the Swedish University of Agriculture Sciences for examining specimens and providing information on the generic placement of the species treated in this paper. Thanks are also due to Dr. Arnold Menke of the Systematic

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Entomology Laboratory, U.S. Department of Agriculture for arranging the loan of type specimens from the U.S. National Museum of Natural History, and to Dr. Robert Wharton, University of Texas for loan of leafminer associated specimens from the southern U.S. and Mexico, which were examined in connection of this study.

Holotype and allotype specimens of the new species described in this paper are deposited in the Bernice P. Bishop Museum, Honolulu.

KEY TO GENERA OF EUCOILIDAE ASSOCIATED WITH AGROMYZID LEAFMINERS IN HAWAII

1. Mesoscutum with notauli present, these may be complete (fig. 1A) or reduced to vestiges on anterior and posterior margins of scutum, if vestigial, posterior vestige consists of at least a short median longitudinal carina (fig. 1B); gaster without a basal hair ring 3
- Mesoscutum without discernible notauli; gaster with a definite ring of setae at base of second tergite (the large tergite which covers most of the gaster) 2
2. Radial cell of forewing relatively short and broad, no more than twice as long as broad (fig. 5C); clypeus with a small conical protuberance on anterior margin; scutellar plate with a subcentral circular pit (our species) (fig. 5B) or an elliptical subapical pit; posterior margin of metapleurite defined by a continuous narrow ridge *Ganaspidium* Weld
- Radial cell of forewing more elongate, more than twice as long as broad; clypeus without such a protuberance; scutellar plate with a circular or subcircular subapical pit; posterior margin of metapleurite with central portion depressed, poorly defined, upper and lower segments of marginal ridge not continuous *Weldia* Yoshimoto
3. Pronotum with a relatively flat area on either side of true pronotal plate, the lateral margin of which is marked by a distinct ridge (fig. 1C); notauli distinct over entire length, or interrupted or evanescent only partially near midlength *Gronotoma* Förster
- Pronotum with flat areas at sides of pronotal plate less strongly defined, the lateral ridges incomplete or weakly indicated; notauli indicated only by anterior and posterior vestiges in our species *Disorygma* Förster

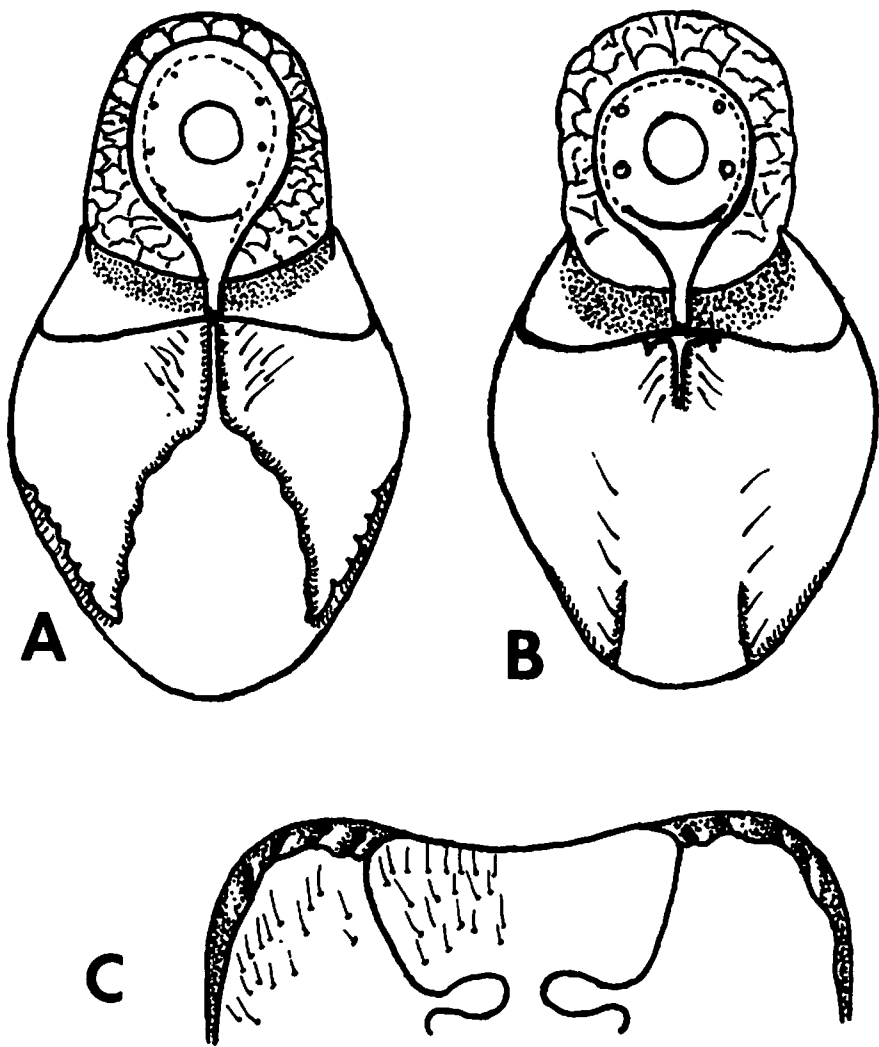


FIGURE 1. A-B, dorsum of mesoscutum and scutellum; A, *Gronotoma melanagromyzae*; B, *Disorygma pacifica*. C, Anterior aspect of pronotum of *G. melanagromyzae*. (C not to same scale, all figures diagrammatic).

Genus *Gronotoma* Förster

Gronotoma Förster 1869, Verh. Zool. Bot. Ges. Wien 19:346; Hedicke 1930, Duet. Entomol. Zeit. 1930: 75.

Eucoilidea Ashmead 1887, Trans. Amer. Entomol. Soc. 14: 154; Weld 1952, Cynipoidea (Hymenoptera) 1905-1950: 248; Yoshimoto 1962, Pacific Insects 4: 844.

Type species: *Eucoila sculpturata* Förster.

Hedicke's treatment of *Eucoilidea* as a synonym of *Gronotoma* was not followed by Weld (1952), Yoshimoto (1962) or Burks (1979). However, Nordlander (personal communication) has studied the type species of both genera, and he agrees with Hedicke. For this reason, *Eucoilidea* Ashmead is here treated as a junior synonym of *Gronotoma* Förster.

Gronotoma is represented in the Hawaiian fauna by three species, all of which appear to be recent accidental immigrants. Two of these are described as new below. *Eucoilidea rufula* Yoshimoto is here placed as a synonym of *G. micromorpha* (Perkins).

Gronotoma has been distinguished from other eucoilid genera present in Hawaii primarily on the basis of the presence of well-defined notauli (called "parapsidal furrows" by Weld 1952 and Yoshimoto 1962a), and the absence of a basal ring of setae on the second tergite of the gaster. A further character that can be used to separate *Gronotoma* species from those of other genera which parasitize agromyzid leafminers in Hawaii is the structure of the pronotum. In *Gronotoma* the true pronotal plate is rather small and not strongly separated from the remainder of the pronotum. On either side of the true plate there is a relatively flat area, the outer margin of which is separated from the sides of the pronotum by a well-defined ridge (fig. 1C). In two of our species, *micromorpha* and *melanagromyzae* n. sp., the lateral margins of the true pronotal plate are defined by a fine ridge. However, in *G. adachiae* n. sp. these ridges are not evident or very weakly indicated, so that the lateral areas are not differentiated and appear to be a part of an enlarged pronotal plate.

KEY TO HAWAIIAN SPECIES OF GRONOTOMA

1. Mesoscutal notauli weakly developed, evanescent or interrupted near middle of disc; mesopleural subalar depression with 2 or 3 distinct ridge-like striations extending to anterior margin of mesopleurite; pronotal plate without well defined lateral ridges separating it from adjacent flat areas on either side *G. adachiae*, n. sp.
- Mesoscutal notauli well defined over entire length; mesopleural subalar depression without striations; pronotal plate separated from adjacent flat area on each side by a fine ridge 2

2. Malar space of face not striate, except very narrowly along malar suture; scutellar plate strongly raised, the anterior stem sharply declivous (fig. 2G); lower portion of mesopleurite below mesopleural suture relatively short and broad, without a patch of setae (fig. 2F)..... *G. micromorpha* (Perkins)
- Malar space striate along entire lower margin; scutellar plate less strongly raised, stem less sharply declivous (fig. 3D); lower part of mesopleurite more elongate, with a patch of fine setae near lower margin (fig. 3E) . *G. melanagromyzae*, n. sp.

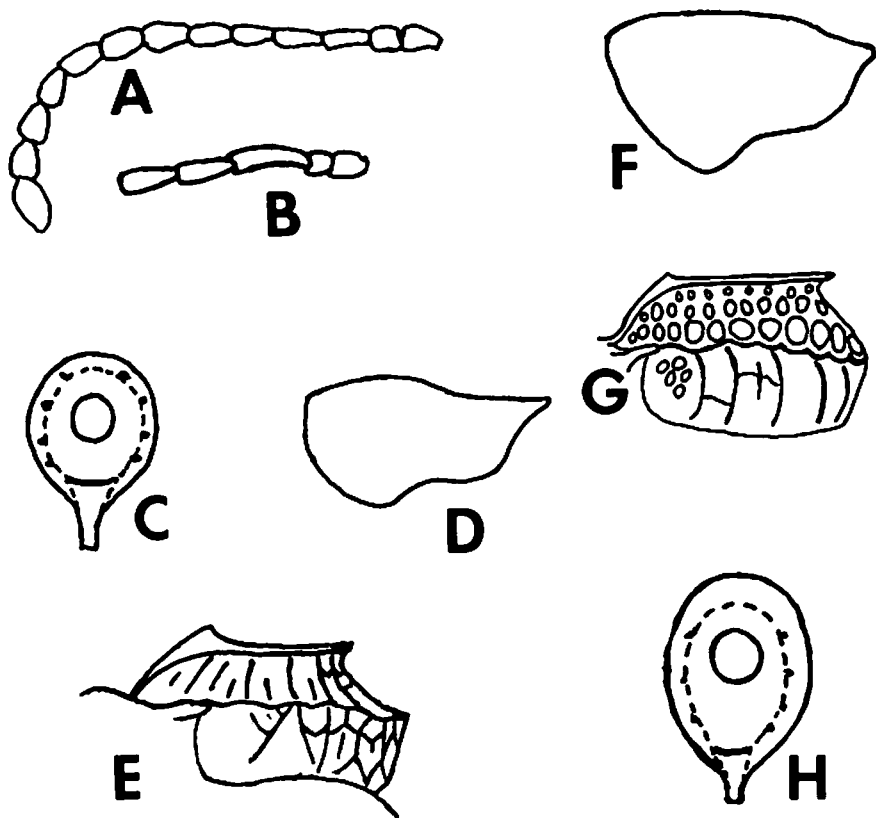


FIGURE 2. *Gronotoma* spp. details: A-E, *G. adachiae*; F-H, *G. micromorpha*. A, ♀ antenna; B, basal segments of ♂ antenna; C and H, dorsum of scutellar plate; D and F lower part of mesopleuron; E and G, lateral aspect of scutellum.

***Gronotoma micromorpha* (Perkins) (figs. 2F-H, 4B), NEW COMBINATION.**

Eucoilidea micromorpha Perkins 1910, Fauna Hawaiiensis 2(4): 676;
Yoshimoto 1962, Pacific Insects 4: 844.

Eucoilidea rufula Yoshimoto 1962, Pacific Insects 4: 845, *New Synonymy*.

Females of this species can be separated from both *G. adachiae* n. sp. and *G. melanagromyzae* n. sp. by the largely smooth malar space, with only 2 or 3 striations closely parallel to the malar suture. Both of the new species have longitudinal striations along the entire mandibular edge of the malar space. Also, the radial cell of the forewing is slightly more elongate (fig. 4B) and the notauli are usually more strongly developed than in *G. adachiae*. From *G. melanagromyzae* it can be distinguished also by the more strongly raised scutellar plate (fig. 2G) and the relatively short, broad and hairless lower mesopleurite (fig. 2F).

I have examined specimens of the type series of Yoshimoto's *E. rufula*, including the holotype, and I am unable to find structural differences between these specimens and the type of *micromorpha*. In his Key to Hawaiian *Eucoilidea*, Yoshimoto (1962a: 844) separated *rufula* on the basis of a 5-segmented club in the female antenna, vs. an 8-segmented club in *micromorpha*. However, neither Yoshimoto's illustrations nor the available specimens show such differences. None of the Hawaiian *Gronotoma* species possess well-defined antennal clubs; rather, the segments from the fifth outward become gradually wider. Rhinaria are present on antennal segments 4 to 13 in the holotypes of both *micromorpha* and *rufula*.

Yoshimoto's figure of the face of *E. rufula* shows an area of 4-5 striations along the outer margin of the malar suture, and his description states: "Distinct striation below genal [=malar] suture." However, in the specimens which I have examined, including the holotype, no more than two or three such striations, all close to the suture, are evident, as in all *micromorpha* specimens.

The only consistent difference between specimens assigned by Yoshimoto to *rufula* and those which he placed as *micromorpha* which I can verify is the more reddish-brown coloration of the former. I am not convinced that this difference is of taxonomic significance.

Distribution: Hawaii (Maui, Molokai, Oahu), Guam, Florida. The Florida record is based on a female specimen in the University of Texas collection which is labeled: Florida, Hillsborough Co., Ruskin, IX-28-1982, D. J. Schuster, on *Liriomyza* on *Bidens*. Yoshimoto (1963) reported *E. rufula* from Tahiti, but I have not examined the specimens.

Hosts: *G. micromorpha* has been reared from *Calcomyza humeralis* (Roser) in "aster" and what is believed to be the same host in *Erigeron canadensis* L. Other specimen label records are from *Amauromyza maculosa* (Malloch), and from "leafminer" in daikon. On Guam it has been reared from *Liriomyza trifolii* (Burgess) in bean leaves (specimens submitted by Dr. D. Nafus, University of Guam). The hosts cited by Yoshimoto (1962a) for *E. rufula*, as "*Agromyza*" in radish and in *Lobelia*, were probably misidentifications for species of *Liriomyza* (see Hardy and Delfinado 1980).

Gronotoma adachiae, new species (figs. 2A-E, 4C).

Female: length 1.1 mm. (range 1.0 - 1.2), forewing 1.2 mm. Head and mesosoma shiny black, gaster dark brown, antennae and legs light brown.

Head slightly wider than mesosoma, about as wide as long in dorsal aspect; malar distance (measured along malar suture) equal to about one-half height of compound eye; lower portion of malar space distinctly striate, with a small pointed projection on lower margin; clypeus with a small, mesal, conical projection near apex; width of face at narrowest point approximately twice width of an eye, face with scattered fine pale setae. Antennae 13-segmented, slightly shorter than body, segments from 4 outward becoming gradually shorter and broader as figured (fig. 2A).

Pronotal plate appearing as a wide area bounded on its posterior and lateral margins by a fine ridge. (This plate apparently includes both the true pronotal plate and the flat area laterad of the plate which is characteristic of *Gronotoma*); separation between true plate and lateral flat areas not or barely evident; with a series of very short, fine, longitudinal ridges extending posteriorly from diagonal ridge marking boundary of lateral flat area, these becoming longer and stronger toward the lower lateral portion of the pronotum, the most lateral 3 or 4 ridges on each side extending to posterior margin of pronotum; pronotum with scattered fine pale setae. Mesoscutum with central portion between notauli slightly raised; notauli well defined anteriorly but becoming evanescent near midlength, forming a relatively narrow, flat-topped mesal carina posteriorly; with a sparse row of fine pale setae along anterior and lateral margins. Scutellar disc with strong reticulate ridging behind, ridging less strongly developed anteriorly, anterior fossae smooth and shining; scutellar plate (fig. 2C, E) strongly raised, anterior neck sharply declivous, dorsal surface sloping gently inward to a relatively small, deep, subcentral pit, margin of plate usually with 3 small raised tubercles on each side, anteriorly with a distinct, transverse, somewhat arcuate raised ridge highest at middle. Mesopleurite with subalar depression distinctly striate, the striations (usually 3) extending to anterior margin; lower portion below mesopleural suture with fine, shallow, pustulate sculpture. Metapleurite with a longitudinal ridge extending from upper edge of propodeal spiracle to anterior margin, a second ridge extending diagonally upward from postero-ventral corner of metapleurite to anterior end of upper ridge, the triangular area bounded by these ridges and posterior margin of metapleurite appearing somewhat raised, flat, and bearing several (ca 8-10) long, fine, pale setae on its posterior part. Propodeum with dorsal part between sublateral carinae smooth, shining, hairless; antero-lateral areas with a thick patch of pale setae; postero-lateral margin with a patch of long erect pale setae. Forewing with radial cell relatively short and broad (fig. 4C), veins pale; ratio of radial cell length (outside dimension) to wing length 2:9.

Gaster about as long as mesosoma; large second tergite enclosing posterior segments.

Male: Generally similar to female; antennae 15-segmented, slightly longer than body, segment 3 about 1.3 times as long as 4, slightly curved, flattened on inner face (fig. 2B).

Described from 36 specimens. Holotype female, allotype male and 15 paratypes: Oahu, Manoa Valley (University of Hawaii Campus), 1952, M.S. Adachi Collector, reared ex leafminer. Associated host adults subsequently determined as *Pseudonapomyza spicata* (Malloch) by D. E. Hardy. Nineteen additional paratypes: Oahu; Ewa, Barbers Point and Waipio, all collected between I·9·1961 and XII·1965, by J. W. Beardsley; none associated with hosts.

This species is named in honor of Mrs. Marion Adachi Kohn, a colleague and friend, who reared the first known collection.

Distribution: Hawaii (Oahu). An immigrant of unknown origin.

Host: *P. spicata* (Malloch), the only recorded host, mines in the leaves of various grasses, including sugarcane, corn and sorghum. The host is of widespread distribution in the Pacific and Oriental tropics (Hardy and Delfinado 1980).

G. adachiae can be distinguished from other Hawaiian *Gronotoma* by the characters given in the key to species. In addition, the radial cell of the forewing is slightly shorter and broader than in either of the other two Hawaiian species (fig. 4).

***Gronotoma melanagromyzae*, new species (figs. 1C, 3, 4B).**

Female: Length 1.7 mm (range 1.6 - 1.8); forewing 1.7 mm. Head and thorax shiny black; gaster dark brown; legs, antennae and mandibles brown to brownish yellow.

Head slightly wider than thorax, width in dorsal aspect slightly less than twice its length; malar distance (measured along malar suture) equal to one-half height of compound eye, malar space mostly smooth, shiny, distinctly striate along lower margin and narrowly along malar suture. Clypeus smoothly convex but without a distinct conical projection; width of face at narrowest point about twice width of compound eye. Antennae 13-segmented, nearly as long as body, segments from 4 outward becoming gradually shorter and broader (fig. 3A).

Pronotal plate (fig. 1C) well defined, posterior margin slightly concave mesally, posterior section of plate with moderately dense scattered pale setae, mesal bridge rather narrow, a fine well defined ridge separating posterior part of plate from lateral flat area of pronotum on each side; lateral flat areas and posteriolateral portions of pronotum with scattered pale setae. Mesoscutum with central portion between notauli slightly raised; notauli well defined over entire length, appearing as if formed of a coalesced series of shallow crenulations, these continuing laterally along anterior margin of scutum; posterior part of central raised area forming a relatively narrow, flat-topped carina (fig. 1A). Scutellum rounded behind, slightly protruding posteriorly over base of propodeum; scutellar disc strongly, somewhat irregularly reticulate-rugose; lateral bars continuous with a somewhat irregular longitudinal ridge which extends post-

eriorly around apex of scutellum marking its widest dimension (scutellar margin); area below this ridge coarsely reticulate (fig. 3D). Scutellar plate (fig. 3C) with a deep subcentral pit; dorsal surface sloping slightly inward to pit, with some poorly defined transverse striations anteriorly; neck moderately declivous; with a row of about 3 small submarginal tubercles on each side, each bearing a very short fine seta; with a distinct, semi-transparent marginal rim extending over disc. Mesopleurite with subalar depression not noticeably striate; lower portion below mesopleural suture more than twice as long as broad, bearing a patch of pale setae near lower margin (fig. 3E). Metapleurite with posterior margin marked by a distinct, thin, somewhat irregular ridge extending from margin of propodeal spiracle to lower edge of sclerite; a diagonal band of long pale setae extending from just below base of hind wing to postero-ventral corner of metapleurite, plus some shorter, finer, pale setae scattered along the ventral margin. Lateral portions of propodeum with a contiguous patch of similar long setae; dorsum of propodeum, between strongly raised dorsolateral carinae, sparsely clothed with short, fine setae; anteriolateral part of propodeum with a moderately dense patch of semi-decumbent pale setae. Forewing with radial cell moderately large (fig. 4A), its maximum length equal to a bit more than one-third of distance from its base to wing apex.

Gaster about as long as mesosoma; large second tergite enclosing posterior segments.

Male: Length 1.5 mm. Generally similar to female. Antennae 15-segmented, longer than body (ca. 2.0 mm); third segment elongate, strongly curved, flattened on inner face (fig. 3B).

Described from 9 specimens. Holotype female, allotype male and 5 paratypes (4 females, 1 male): Oahu; Honolulu, IX•1954, J. W. Beardsley, reared from puparia of *Melanagromyza splendida* Frick mining stems of *Bidens pilosa*. Additional paratypes; female, Oahu, Ewa XII•1961, J. W. Beardsley; male, Oahu, Ewa IV•23•1964, J. W. Beardsley, ex *Bidens pilosa*. A single female, lacking gaster, from Hawaii Island, Kamoamoa, Hawaii Volcanos National Park, 11•8•1966, N. L. H. Krauss, is also at hand. I have also seen specimens from the University of Texas collection, from near Austin, Texas; College Station, Texas, and from N. Leon, Cola de Caballo, Mexico, which appear to belong to this species. There are several specimens in the U.S. National Museum collection from Webster Grove, Missouri, some labeled as reared from *Melanagromyza virens* in artichoke, which also seem to be this.

Distribution: Hawaii (Oahu, Hawaii), Missouri, Texas, Mexico.

Host: *Melanagromyza splendida* Frick.

This species can be easily separated from *C. micromorpha* by its larger size, the presence of striations along the lower margin of the malar space, the less strongly raised scutellar plate, the shape of the lower part of the mesopleurite and the presence there of a patch of fine setae. *Eucoilidea guamensis* Yoshimoto (1962) (holotype examined) is somewhat similar in size, but can be readily distinguished by its more elongate-oval scutellar

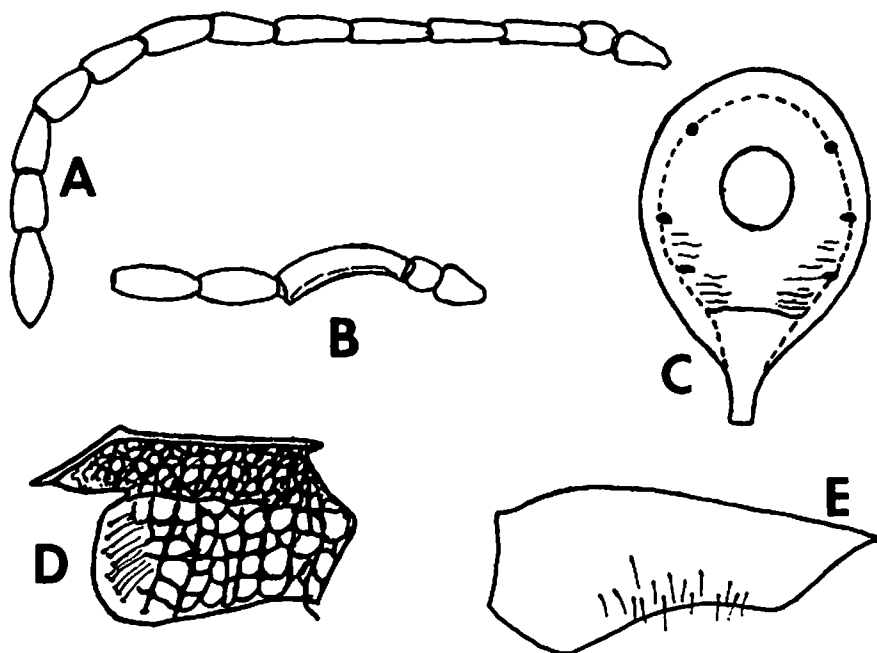


FIGURE 3. *Gronotoma melanagromyzae* details. A, ♀ antenna; B, basal segments of ♂ antenna; C, dorsum of scutellar plate; D, lateral aspect of scutellum, E, lower portion of mesopleuron.

plate with the anterior portion even less strongly raised; malar space not striate along lower margin; and lower portion of mesopleurite lacking a setal patch. The forewing of *guamensis* has a distinctly larger radial cell, about as long as half the distance from its base to the wing apex. The antennae have the fifth segment distinctly shorter than the fourth, and the outer segments are shorter and broader than in *melanagromyzae*. Furthermore, the head is distinctly wider than the thorax in *guamensis*. The holotype male of *Eucoilidea longicornis* Ashmead also was compared. Although generally similar to the male of *G. melanagromyzae*, the *E. longicornis* type differs in several significant details. The scutellum in *longicornis* is distinctly more strongly raised posteriorly and the scutellar plate is more elongate-oval in form and extends posteriorly as far as the apex of the disc. The central pit of the plate is distinctly more elongate in form than is that of *melanagromyzae*, and the anterior transverse striations, found on the plate of the latter species, are not developed.

Genus *Disorygma* Förster

Disorygma Förster 1869, Verh. Zool.-Bot. Ges. Wien 19: 346; Nordlander 1976, Entomol. Tidskr. 97: 73.

Type species: *Eucoila depilis* Giraud.

Nordlander (1976) redefined the genus *Disorygma*, based on the type species and the related European species *Eucoila curta* Giraud, and contrasted *Disorygma* with the allied genera *Gronotoma*, *Diglyphosema* Förster and *Microstilba* Förster. These genera apparently constitute a closely related group, all of which probably parasitize larval Agromyzidae.

Disorygma pacifica (Yoshimoto), **NEW COMBINATION** (fig. 4D).

Cothonaspis pacifica Yoshimoto 1962, Ins. Micronesia 19(3): 105; 1962, Pacific Ins. 4:843.

Nordlander (1976) redefined and revised the genus *Cothonaspis* Hartig. Although he did not treat *C. pacifica*, it was clear from his paper that this species was not properly placed in *Cothonaspis*.

Specimens identified by me as *pacifica*, based on comparison with the holotype, were sent to Dr. Nordlander who placed the species in *Disorygma*. This genus is obviously close to *Gronotoma*. The structure of the pronotum in *pacifica* appears to be intermediate between *Gronotoma*, which has a well-defined outer ridge and outer flat area adjacent to the true pronotal plate, and *Disorygma*, which Nordlander (1976) described as lacking these structures.

Among other species parasitic on agromyzid larvae in Hawaii, *D. pacifica* most nearly resembles *Gronotoma adachiae*. However, in *pacifica* the notauli are even more reduced, being represented only by vestiges on the anterior margin and a short median longitudinal carina on the posterior margin of the scutum (fig. 1B). Additionally, in *G. adachiae* the lower

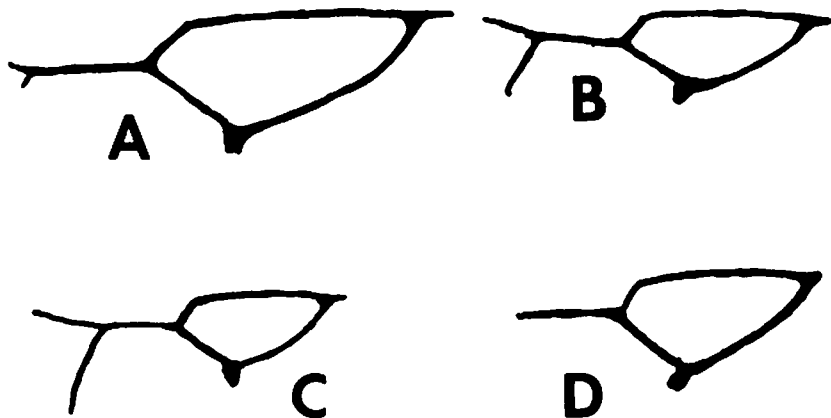


FIGURE 4. Radial cell of forewings (setae omitted). A, *Gronotoma melanagromyzae*; B, *G. micromorpha*; C, *G. adachiae*; D, *Disorygma pacifica*.

portion of the malar space is more extensively striate and the lateral pronotal ridges much more strongly developed.

Distribution: Wake Island (Type locality); Hawaii (Hawaii, Maui, Molokai, Oahu, Kure I.), Texas. Yoshimoto (1963) reported this species from Tonga, but I have not examined the specimens. Nordlander, in correspondence, stated that he has seen a specimen similar to *D. pacifica* which was reared from pepper leaves in Texas. In addition, I have examined a series of 15 specimens from the University of Texas collection, from Crystal City, Texas, which were reared from *Liriomyza* puparia from leaves of bean and other hosts by J. A. Harding, during 1962 and 1963. These records suggest that the species is of American origin.

Hosts: Specimen label records indicate that *D. pacifica* has been reared from puparia of *Liriomyza* spp. from alfalfa, daikon, eggplant and tomato, and from *Amauromyza maculosa* (Malloch) in an unspecified host plant.

Genus *Ganaspidium* Weld

Ganaspidium Weld 1955, Proc. Entomol. Soc. Washington 57: 274.

Beardsley 1986, Proc. Hawaii. Entomol. Soc. 26:36.

Type species: *Ganaspidium pusillae* Weld.

In an earlier paper (Beardsley 1986) I assigned *Eucoilia hunteri* Crawford to *Ganaspidium*, and contrasted that species with *G. pusillae*. I noted differences between the holotype of *hunteri* and Hawaiian *Ganaspidium* specimens, but assigned them to that species. More recently, Nordlander (personal communication) has examined *Ganaspidium* specimens at the U.S. National Museum and has concluded that Hawaiian *Ganaspidium* represents a previously undescribed species. This species is described below.

***Ganaspidium utilis*, new species (fig. 5).**

Ganaspidium hunteri, Beardsley 1986, Proc. Hawaii. Entomol. Soc. 26:37 (misidentification).

Female: Length 1.2 mm (range 1.1-1.3), forewing 1.2 mm. Color black, antennae and legs mostly very dark brown to blackish, tibiae, particularly at base and apex, and tarsi paler.

Head a little wider than thorax, relatively short and broad in dorsal view, about twice as wide as long; face between eyes about twice as wide as a compound eye; malar distance measured on malar suture equal to about one-half height of compound eye; malar space striate on mandibular margin, mesal part of margin slightly raised to form a small projection; clypeus with a small, broadly conical, mesal projection near margin; face below antennal fossae with sparse pale setae. Antennae 13-segmented, shorter than body, with a 9-segmented club, segments 3 and 4 subequal.

Pronotal plate not strongly separated from remainder of pronotum, posterior and lateral margins forming a fine ridge, posterior margin concave mesally, with a row of strong setae just before margin, surface smooth; pronotum with additional setae on anterior portion laterally,

otherwise smooth, shining, without lateral diagonal ridges. Mesoscutum smooth, shining, with a marginal row of setae laterally. Scutellum distinctly raised, disc smooth, shining, with a marginal row of setae, rounded behind, not margined, posterior edge marked by a fine ridge, with two incomplete vertical ridges on each side extending from edge toward scutellar plate, their upper portions curving anteriorly, reaching about halfway to plate, and a third, much shorter ridge behind these (fig. 5A). Scutellar plate large, in dorsal aspect covering nearly all of disc, more or less circular, weakly oval in outline (fig. 5B), with a narrow, sharply declivous anterior neck; dorsal surface nearly flat or very slightly concave, with a moderately large, circular subcentral pit and a series of small pits along margin. Mesopleuron smooth, shining, without discernible striation. Metapleuron with a patch of moderately long, pale setae on dorsal portion which obscures presence of ridges in this area; pocket in lower anterior corner with a dense patch of setae. Propodeum with a sparse patch of moderately long, erect setae below spiracle laterally, and more or less decumbent setae mesally. Forewing with radial cell about 1.7-1.8 times as long as wide (fig. 5C), veins forming radial cell somewhat thicker than anterior veins.

Gaster with petiolar segment often partly hidden, not expanded on posterior portion; large second tergite smooth, shining, with a narrow basal ring of strong, erect setae with apices bending posteriorly. Second tergite enclosing gaster to apex laterally, posterior segments not visible in lateral view, but exposed behind. Posterior tergite, viewed from behind, very finely, shallowly punctate.

Male: Similar to female; antennae 15-segmented, longer than body, segments 3 and 4 of subequal length, 3 flattened on inner face.

Described from 22 specimens. Holotype, allotype and 5 paratypes: Nanakuli, Oahu, X 3•1977, P. D. Mothershead, reared ex *Liriomyza* pupae from cucumber leaves. Additional paratypes: 17 specimens from Waianae, Kahuku and Honolulu, Oahu, IX 1977 to XI 1984, reared from *Liriomyza* pupae from tomato, watermelon and unspecified plant host leaves.

Distribution: Hawaii (Oahu), Texas, Mexico. The Mexican record is based on specimens seen by Nordlander.

Hosts: *Liriomyza sativae* Blanchard, *L. trifolii* (Burgess). Purposely introduced from Texas in 1976.

In my 1986 paper I pointed out two minor structural differences between the holotype of *Ganaspidium hunteri* and the Hawaiian specimens which I assigned to that species. These were the shape of the scutellar plate, which is more triangular in outline in holotype of *hunteri*, and the presence of ridges on the posterior part of the scutellar disc in *hunteri* which were not found in the Hawaiian specimens. In addition to the holotype, I recently examined a paratype and one additional specimen of *hunteri* determined by Nordlander in the USNM. From these specimens it appears that the shape of the scutellar plate may not be a reliable character for separating these species. However, there are differences in the

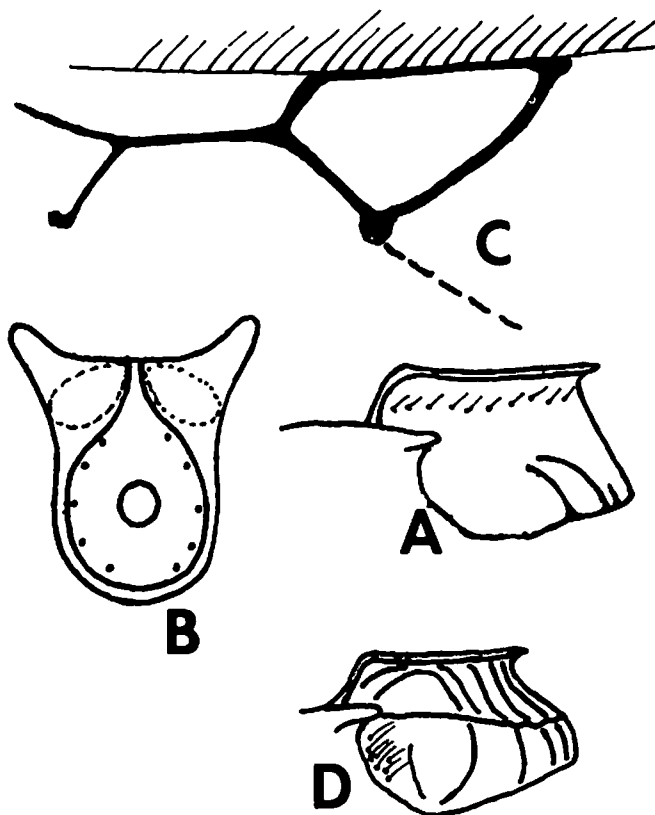


FIGURE 5. A-C *Ganaspidium utilis*. A, lateral aspect of scutellum; B, dorsal aspect of scutellum; C, radial cell of forewing (setae omitted). D, *G. hunteri*, lateral aspect of scutellum.

sculpture of the scutellar disc which seem to be distinctive. In the *hunteri* specimens the scutellar margin, a raised ridge which marks the approximate middle of the disc laterally and behind, is completely developed and extends entirely around the disc (fig. 5D). This structure is absent in *utilis*. Also, in *hunteri*, there are several lateral ridges which extend from beneath the scutellar plate to the marginal ridge, and between that ridge and the lateral margins of the disc, which are not present in *utilis*. These differences appear to constitute valid morphological evidence for the separation of these two species. However, a more thorough study of *Ganaspidium* material from all parts of the Americas is needed for a proper understanding of this group.

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